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ABSTRACT

A reliable and valid technique for measuring college participation rates is proposed, based on national data. The objective is to determine if factors other than state demographic factors systematically influence college attendance by state. Multiple regression equations are used to predict enrollments by using demographic variables such as population by gender, race, and income. The difference between the expected enrollment and actual (residual) is mapped for the 50 states. Using Higher Education General Information Survey data, enrollments are evaluated for females, males, first-time freshmen, full- and part-time students, and for private and public institutions. Major findings are as follows: states with more students in public institutions than predicted tended to be states with lower than predicted enrollment in private institutions, and vice-versa; higher than predicted states in one category of enrollment tend to be higher in other categories except for public versus private, while lower states tend to be lower on other categories also; part-time enrollment is the most variable in actual enrollments and in residuals; states with lower enrollments than predicted tend to border states with higher than predicted enrollment; and the Plains states tend to be lower than predicted on several categories. (SW)

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A COMPARATIVE STUDY OF COLLEGE PARTICIPATION RATES

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A Comparative Study of College Participation Rates

An output measure of the performance of colleges and universities in meeting the need and demand for higher education is the rate of college participation. This paper reviews previous studies concerning college participation. Additionally, an exploratory data analysis is done to investigate the appropriateness, reliability, and validity of college participation rates. Because of the recent focus of attention on thee effectiveness of colleges and universities, this avenue of research becomes quite apropos.

Investigators such as Chambers (1983) and Christal (1982) have presented comparative data on college participation. However, these studies have been questioned as to their validity (Schwarzmueller and Pounds, 1983). Of key importance to this debate is how one defines the college participation rate. Only after successfully defining this, can a study be made of factors that influence this rate. The focus of this paper is to propose a reliable and valid technique for measuring college participation rate. The data base for this comparative study is the entire United States. Systematic analysis of college attendance and variables which influence college attendance will be made using multiple regression models. A valid measure of college participation should allow more accurate assessments to be made of the effectiveness of higher education.

Review of the Literature

Previous studies have tended to focus upon either the determinants of college attendance (Tierney, 1982) or upon measures of rates of college attendance (Schwarzmueller and Pounds, 1983). Tierney used individual level data from the United States census to conclude that college paticipation varied according to gender, region, and income levels. Schwarzmueller and Pounds studied college participation rates at the state level for the 50

states. They questioned prior studies that had used HEGIS data and in their study employed census estimates. They concluded this study by making recommendations about four barriers to college and university attendance: motivational, geographic, academic and financial.

Past studies generally focused upon rates of participation and ranking the states on the basis of these rates. These normative studies tended to be concerned with finding an appropriate denominator--whether it should be total population or sub categories, such as the adult population. There has not, to date, been a consensus achieved on how to measure college participation rates.

Methods

The purpose of this paper is to approach college participation on an exploratory basis without attempting to be normative. The exploratory approach uses multiple regression analysis to predict college attendance by state using a variety of independent variables. The independent variables include such measures as total population, and other population counts: urban, 18-24 year olds, 25-44 year olds, 45-64 year olds, White males, White females, Black males, Black females, Hispanic males, Hispanic females, high school graduates, college graduates, expenditures on education, median family income, and number below poverty level--total, White, Black and Hispanic--and number of colleges and universities in the state. This list of variables is not exhaustive, but, given that there are only 50 states, it was thought they should tap a wide range of factors, including those found to be important influences by Tierney (1982).

The data for the 50 states included as college participation measures such information from HEGIS as total headcount enrollment, and also

subclassifications as females, males, first-time freshmen, full-time, part-time, private, and public headcount enrollments. Rather than focus on participation rates by states, the multiple regression equations were used to predict enrollments by category and then to calculate the difference between the predicted value given the variables in the equation and the actual count, i.e., the residual. It was thought that the residual was both more informative and more accurate an indicator of college participation. A positive residual for a state indicates that more students are attending than would be expected based upon the demographic states of the state. Correspondingly, a negative residual is indicative that that particular state had fewer students in college than would be expected, given its demographic status. This method is meant to provide a criteria rather than a norm, to use for judgments about the effectiveness of a state's higher education efforts. The residuals are not meant as final statements, but, as information that is inputed into the discussion of these issues.

In addition to looking at total counts, the counts were both reexpressed into natural logarithms and deflate by total population into per capita measures. The reason for this was the obvious heterosedasticity (unstable variance) of the residuals (see Johnston, 1972; Mosteller and Tukey, 1977). Both reexpressions of the data appeared to solve the heteresedasticity problem. However, because the logarithm residuals and per capita residuals were not in counts, the regression equations based on counts are reported. The multiple regression equations are not reported in this paper but are available upon request from the author. The relative position of each state remained the same regardless of whether actual counts, logarithms, or per capita measures were employed in the regression equations.

Findings

The first multiple regression was made upon total headcount enrollment by state with the independent variables being those described above. The residuals from this analysis are presented in Figure 1. The residuals in this figure and those that follow are expressed in thousands of headcounts. Such states as Massachussetts (+25.1 thousand) and Indiana (+26.6) showed many more college students than would be predicted given the demographics of the states while New Jersey (-38.2) and Minnesota (-38.6) showed many fewer than would be predicted. The average residual (Standard Error of Estimate--SEE) was 19.3. The presence of a pattern of residuals is conjectural, though there does appear to be numerous negative residuals for the Plains states. Also, other negative residual states tended to appear surrounded by positive residual states, perhaps indicating a need to investigate the cross flow of students enrolling across close state lines.

The equation for female enrollments produced the residuals shown in Figure 2. The average residual (SEE) was 10.7 thousand. The states with extreme high residuals were Massachussetts (+15.2) and Indiana (+13.8), compared to low residuals of Georgia (-17.6) and Colorado (-20.4). Here again the plains states tended to be negative and other negative states tended to border positive residual states.

The residuals for male enrollment are given in Figure 3. The SEE was 9.2 thousand. The high positive residual states were Indiana (+13.4) and Ohio (+9.8) which share a common border while the high negative states were New Jersey (-19.4) and Minnesota (-21.1). The Plains states also shows this pattern and so does the negative states tending to border with positive states.

In Figure 4, the residuals from the first-time Freshmen headcount multiple regression equation were presented. The average residual was 9.2 thousand (SEE). The high positive residual states are Arizona (+32.6) and Oregon (+14.0), contrasted with their border states of New Mexico (-14.7) and Washington (-16.6). This appears to be evidence of a strong pull of students across state borders, due to either explicit state policy or other factors.

The headcounts of full-time students in colleges and universities were predicted using multiple regression and the residuals are given in Figure 5. The SEE was 13.6 thousand. The states with high residuals are Massachussetts (+26.9) and Indiana (+20.5) with low states of Kentucky (-34.2) and Georgia (-21.0). It is interesting that Indiana borders on Kentucky and another negative state Illinois (-7.1). The Plains states are not consistent in a pattern of negative residuals.

The part-time enrollments were analyzed using multiple regression and the residuals are shown in Figure 6. These residuals have the highest SEE of 35.0 thousand. The highest residual states are Connecticut (+59.0) and North Carolina (+54.5), contrasted with Kentucky (-94.1) and Tennessee (-65.1)--bordering states again. The Plains states pattern of negative residuals does not appear.

The residuals for private colleges and universities appear in Figure 7. The average residual for private enrollment is 18.5 thousand. No obvious pattern of regional residual emerges. The high positive residuals are for Idaho (+17.0) and Massachusetts (+14.3), while extreme negative ones are Arizona (-17.1) and Oklahoma (-25.5). The patterns show that, when

contrasting with Figure 8 for public institutions enrollment, the many negative states for private enrollment have positive residuals for public headcount and vice-versa. For example, Arizona's public enrollment residual is +25.5. The SEE for public enrollment is 18.5. The extreme high residuals are Alabama (+30.7) and Missouri (+27.6), while lows are for New Mexico (-35.8) and Georgia (-35.4). It is noted that high residual Alabama borders on low Georgia, and high residual Arizona (+25.5) with low New Mexico. Low residual Kentucky (-18.9) is bordered by high Indiana (+14.7), Ohio (+7.2), West Virginia (+12.2), Virginia (+16.1), Tennessee (+16.9), Missouri (+27.6), and Illinois (+3.8).

Conclusions and Discussion

This paper has explored the issue of college attendance patterns for the 50 states. Its aim is to determine if factors other than state demographic factors systematically influence college attendance by state. The method used was multiple regression equations to predict enrollments by using demographic variables such as population by gender, race and income. The difference between the expected enrollment and actual (residual) was mapped for the 50 states. Enrollments were taken from HEGIS data for total, females, males, first time freshmen, full-time, part-time, private and public institutions.

The major findings of the study were:

*States with more students in public institutions than predicted tended to be states with lower than predicted enrollment in private institutions and vice-versa.

*Higher than predicted states in one category of enrollment tended to be higher in other categories except for public vs. private. Similarly, lower states tended to be lower on other categories also.

*Part-time enrollments were the most variable in actual enrollments and

in residuals. This may be due to the way different states count part-time enrollments, though states with high residuals on part-time students tended to be higher on other categories, except for private enrollments.

*States with lower enrollments than predicted tend to border states with higher than predicted enrollment. However, the Plains states tended to be lower than predicted on several categories.

*Extreme negative residuals tended to be much higher than extreme positive ones. Perhaps the negative residuals reflected idiosyncratic ways of reporting HEGIS data, or perhaps they were due to specific policy decisions.

The most interesting finding of this study is the spatial factor of bordering states appearing to draw students from states with lower than predicted enrollments. Additional research would have to investigate this interesting hypothesis.

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Figure 1

TOTAL ENROLLMENT

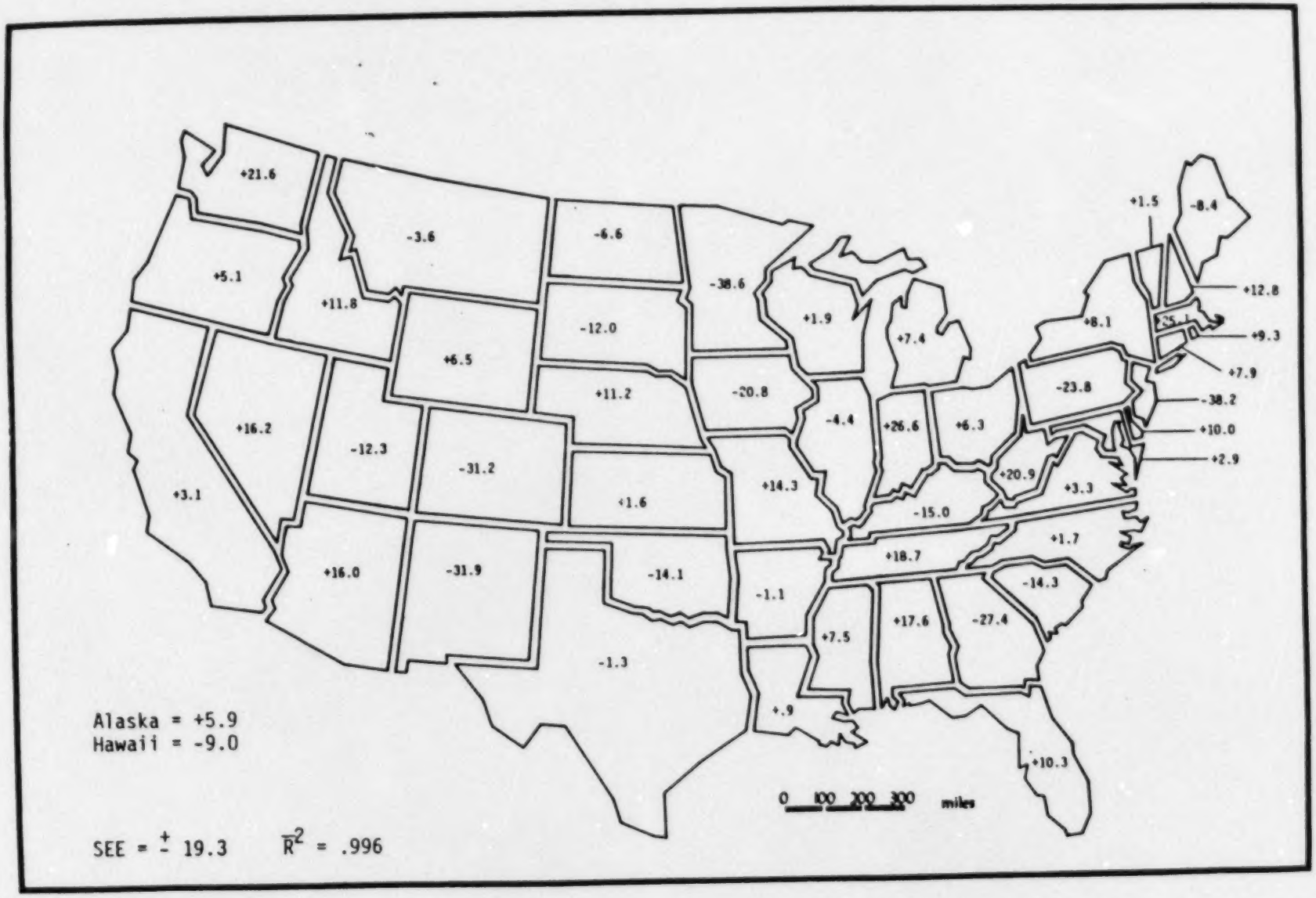


Figure 2

FEMALE ENROLLMENT

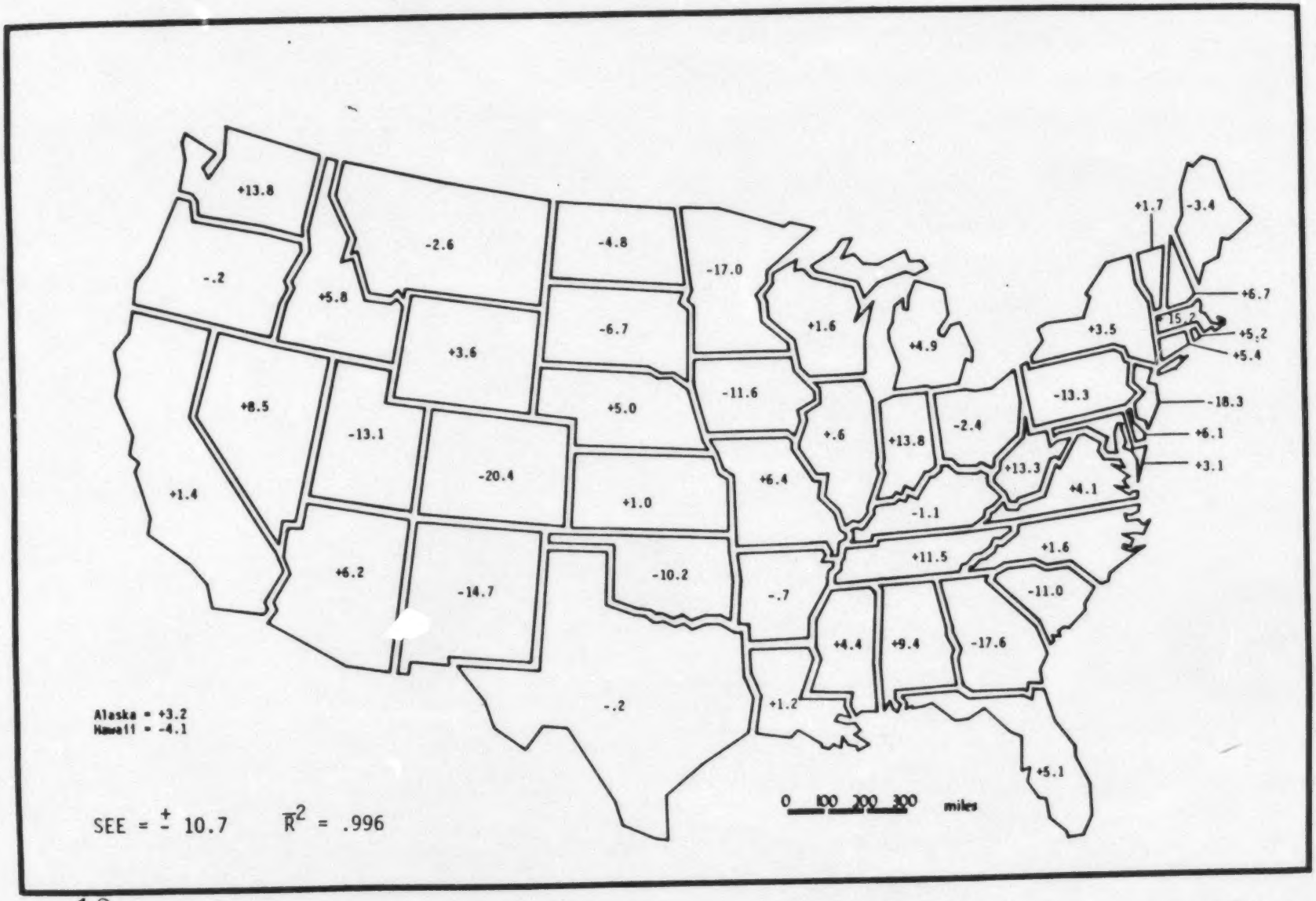


Figure 3

MALE ENROLLMENT

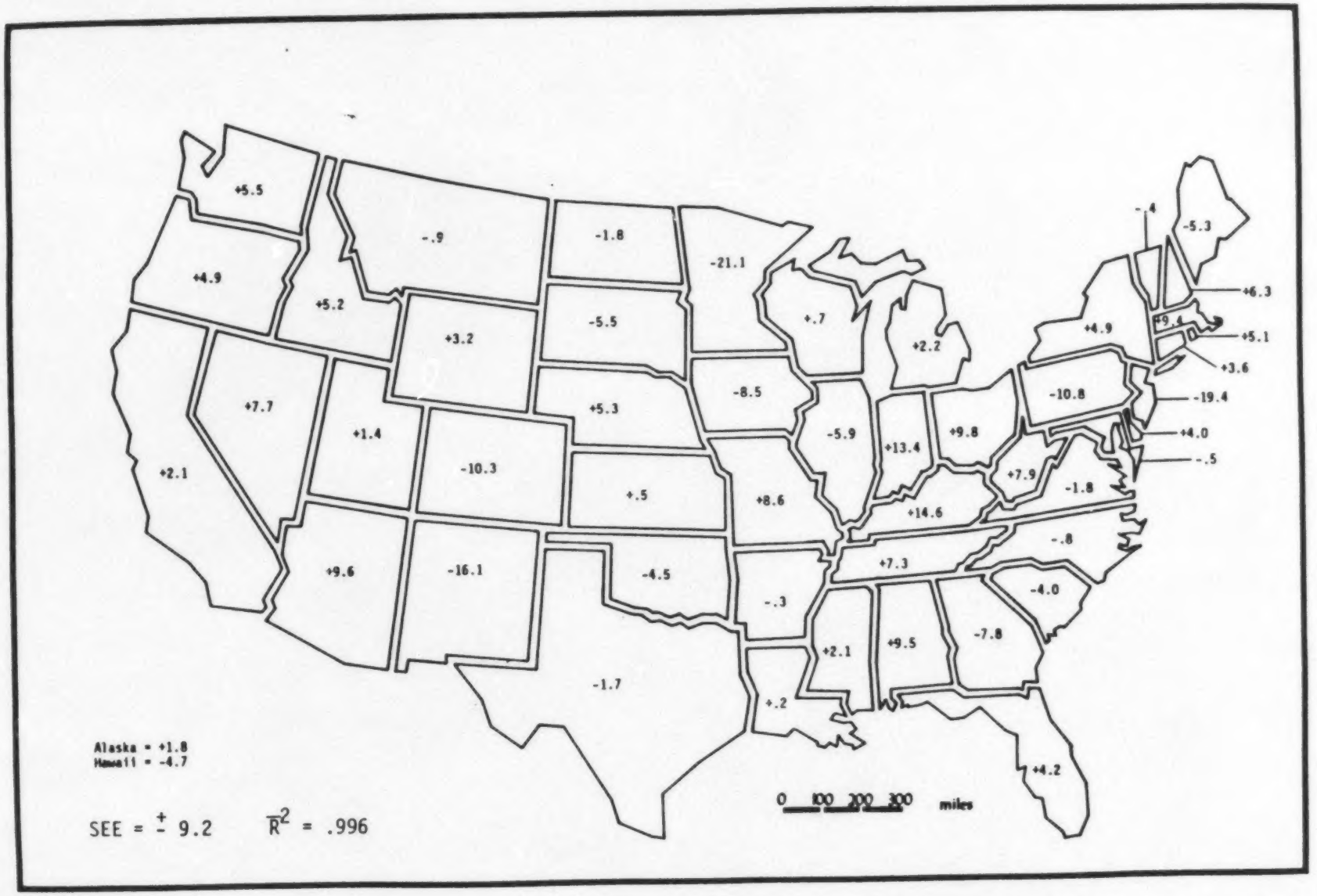
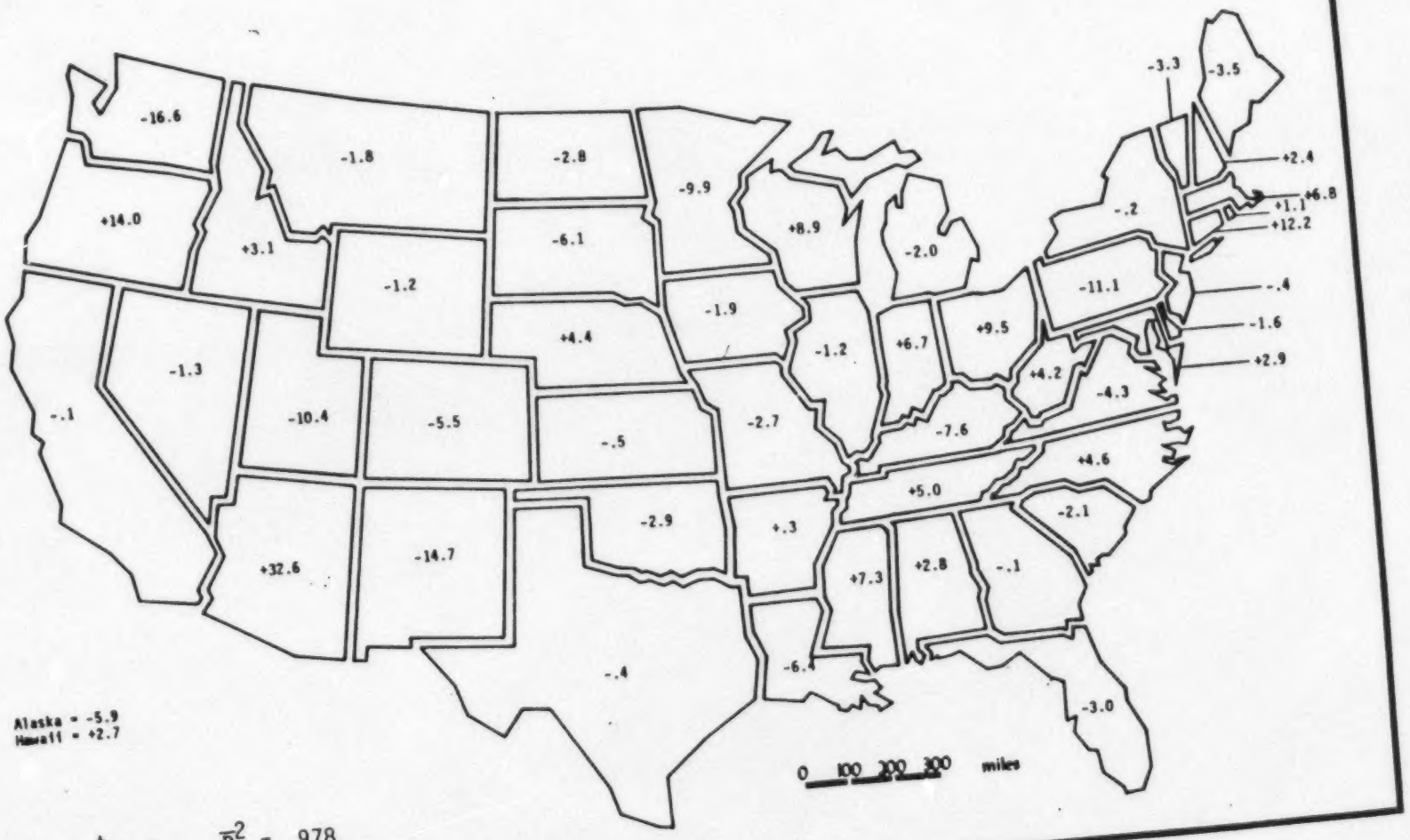


Figure 4

FRESHMAN ENROLLMENT



SEE = $\pm$ 9.2 $\bar{R}^2$ = .978

Figure 5

FULL-TIME ENROLLMENT

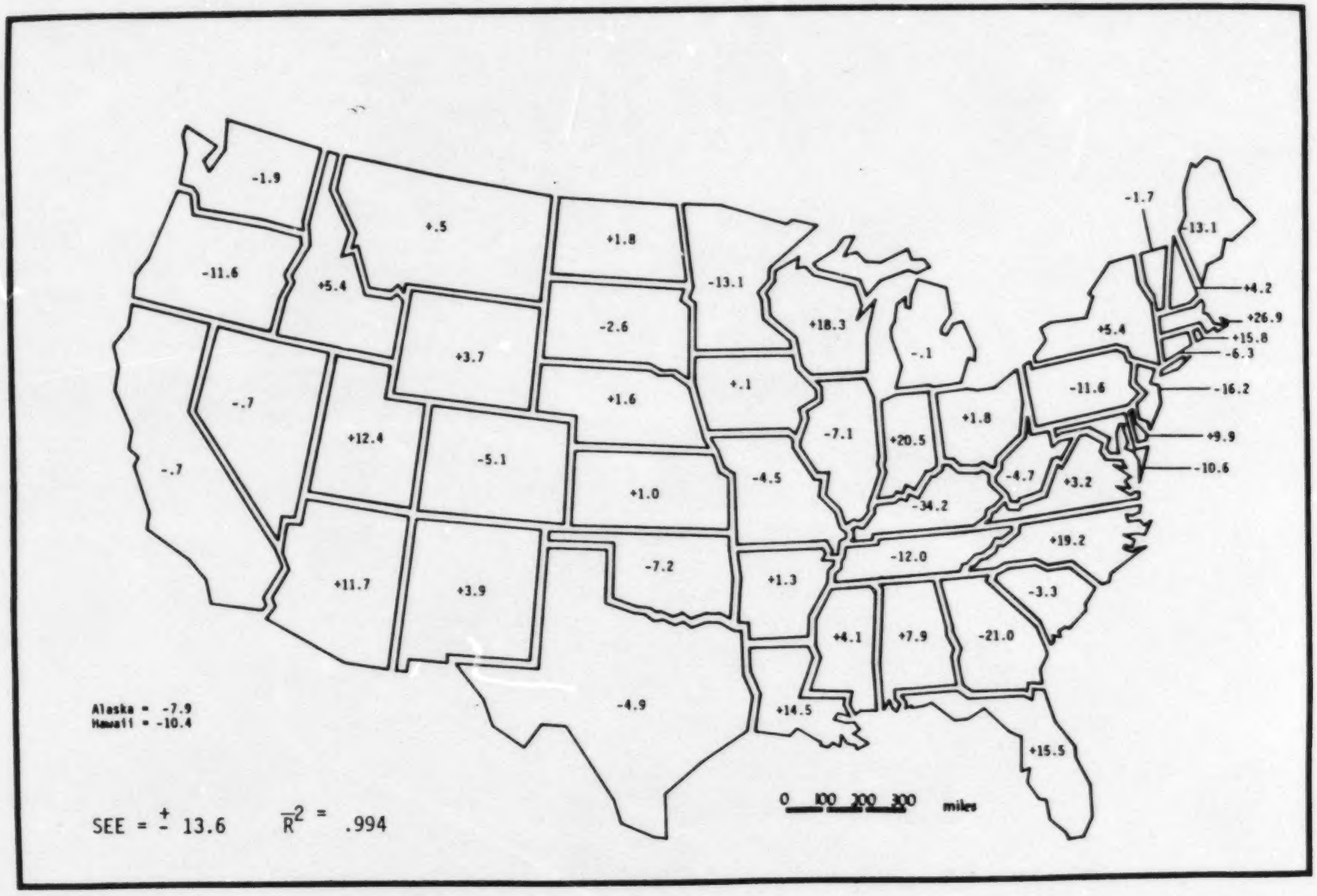


Figure 6

PART-TIME ENROLLMENT

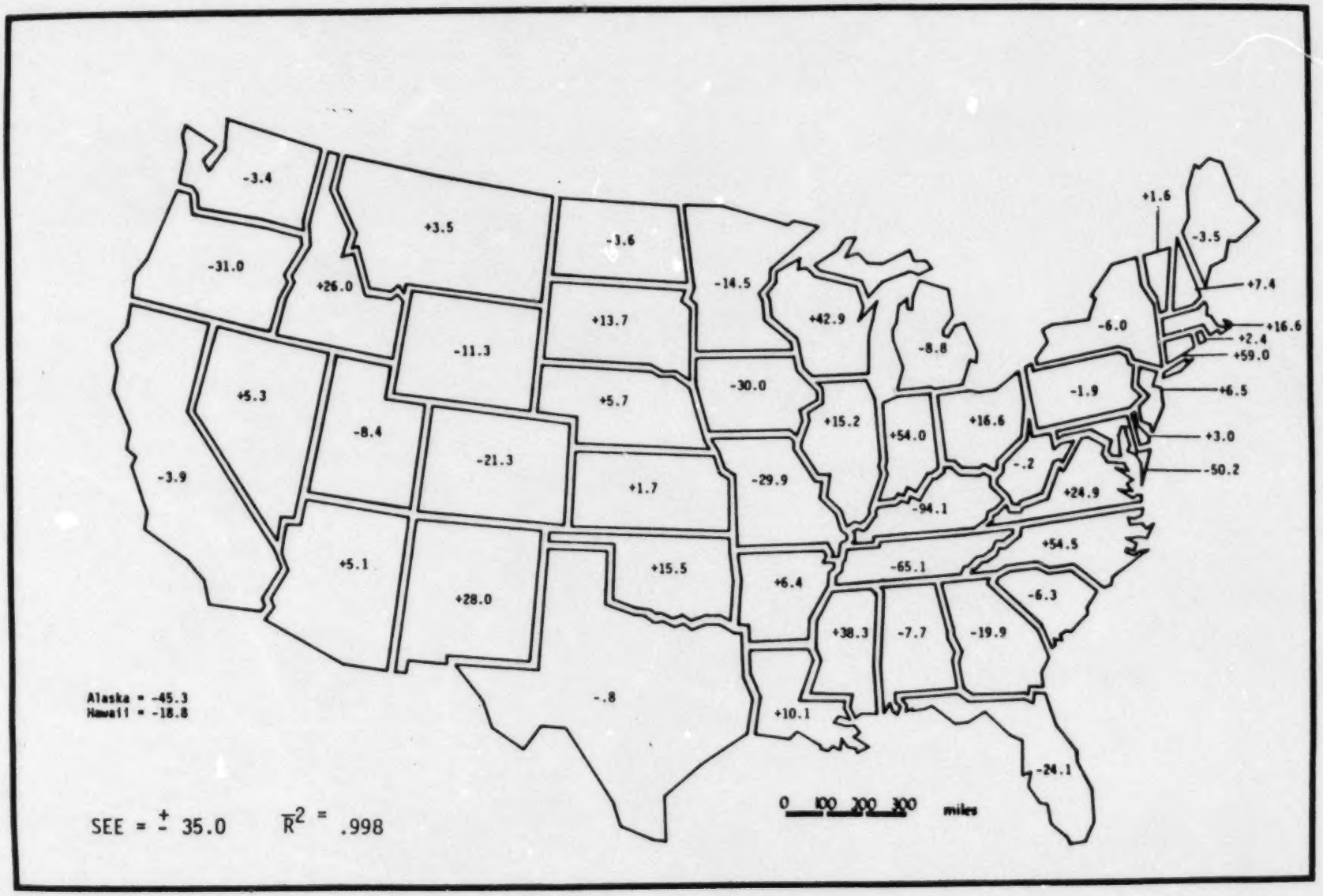


Figure 7

PRIVATE ENROLLMENT

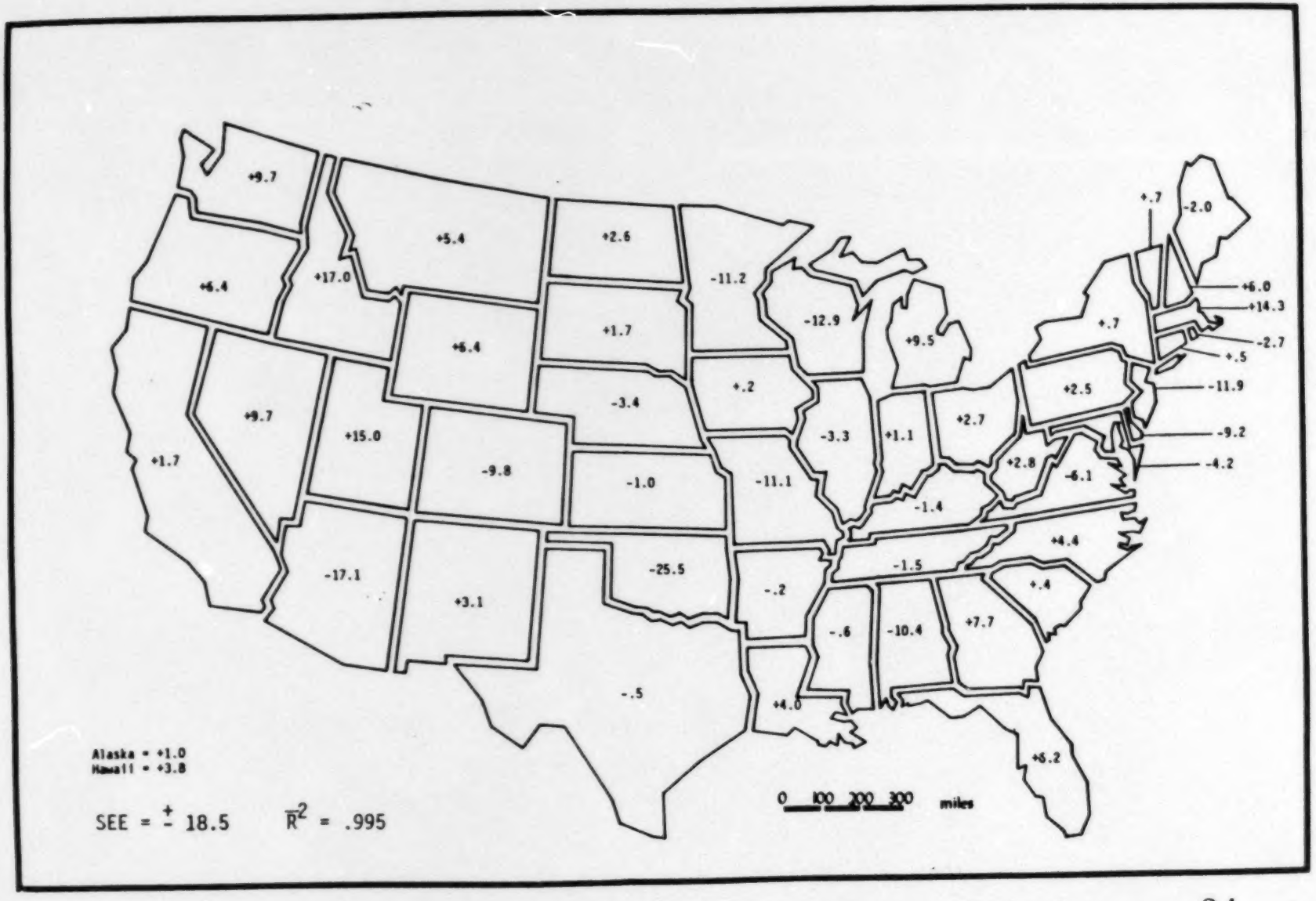


Figure 8

PUBLIC ENROLLMENT